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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: 09/841,636
Confirmation No.: 6234
Filing Date: April 24, 2001
Inventors: Wellington et al.
Title: IN SITU THERMAL PROCESSING OF A HYDROCARBON CONTAINING FORMATION TO PRODUCE A MIXTURE INCLUDING AMMONIA

§

Examiner: E. M. MCAVOY
Art Unit: 1764
Atty. Dkt. No.: 5659-03700/EBM

CERTIFICATE OF MAILING
UNDER 37 C.F.R. §1.8

DATE OF DEPOSIT: Dec. 13, 2005

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Commissioner for Patents
Alexandria, VA 22313-1450

Jackie L. Pitre

FEE AUTHORIZATION

Commissioner for Patents
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Alexandria, VA 22313-1450

Sir:

The Commissioner is hereby authorized to charge the following fees to Shell Oil Co. Deposit Account Number 19-1800/TH1962:

1.	Fee for Filing A Brief In Support Of An Appeal	$500.00
	TOTAL AMOUNT:	**$500.00**

The Commissioner is also authorized to charge any extension fee or other fees that may be necessary to the same account number. If the above-mentioned account is found to have insufficient funds, the Commissioner is authorized to charge Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5659-03700/EBM.

Respectfully submitted,

Eric B. Meyertons
Reg. No. 34,876

Attorney for Applicant

MEYERTONS, HOOD, KIVLIN, KOWERT & GOETZEL, P.C.
P.O. BOX 398
AUSTIN, TX 78767-0398
(512) 853-8800 (voice)
(512) 853-8801 (facsimile)

Date: Dec 13, 2005

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application No.:	09/841,636	Examiner:	E. M. MCAVOY
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APPEAL BRIEF

Mail Stop Appeal Brief-Patents
Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

Further to the Notice of Appeal filed October 13, 2005, Appellants present this Appeal Brief. Appellants respectfully request that the Board of Patent Appeals and Interferences consider this appeal.

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I. Real Party In Interest

As evidenced by the assignment recorded at Reel/Frame 012627/0360, the subject application is owned by Shell Oil Company, a corporation organized and existing under and by the virtue of the laws of the state of Delaware.

II. Related Appeals and Interferences

No other appeals, interferences, or judicial proceedings are known which would be related to, directly affect, be directly affected by, or have a bearing on the Board's decisions in this appeal.

III. Status of Claims

Claims 1-5405 have been entered in the case. Claims 1-4428 and 4449-5395 have been canceled. Claims 4429-4448 and 5396-5405 were rejected in a final Office Action mailed June 14, 2005.

The rejection of claims 4429-4448 and 5396-5405 is appealed.

A copy of claims 4429-4448 and 5396-5405 as currently pending is included as pages 20-24 of the Appendix.

IV. Status of Amendments

A first Office Action was mailed on December 21, 2004. A final Office Action was mailed on June 14, 2005. Appellant has not filed any amendments to the claims after the mailing of the final Office Action.

V. Explanation of the Invention

This invention relates to a mixture of hydrocarbons, H_2, and/or other formation fluids produced from a hydrocarbon containing formation treated using an in situ thermal process. The produced mixture may include hydrogen and ammonia. The mixture may be separated into condensable hydrocarbons, a non-condensable component, and an aqueous phase. The ammonia may be recovered from the aqueous phase. H_2 may be separated from the non-condensable component. See Specification, from page 139, line 19 to page 147, line 11. All future page, paragraph, and line references in this section refer to Appellant's Specification.

Independent claim 4429 describes a combination of features including a mixture produced from a hydrocarbon containing formation. The mixture includes non-condensable hydrocarbons and H_2, wherein greater than about 10% by volume at 25 °C and one atmosphere absolute pressure of the non-condensable hydrocarbons and H_2 is hydrogen (H_2); ammonia and water, wherein greater than about 0.5 % by weight of the mixture is ammonia; and condensable hydrocarbons. Features of independent claim 4429 are described on page 141, lines 6-7; page 142, lines 23-25; page 143, lines 22-25; and page 147, lines 2-11.

Independent claim 5396 describes a combination of features including a mixture produced from a hydrocarbon containing formation. The mixture includes: a non-condensable component comprising hydrocarbons and H_2, wherein the H_2 is less than about 80 % by volume at 25 °C and one atmosphere absolute pressure of the non-condensable component; ammonia and water, wherein greater than about 0.5 % by weight of the mixture comprises ammonia; and condensable hydrocarbons. Features of independent claim 5396 are described on page 141, lines 6-7 and lines 16-18; page 142, lines 23-25; page 143, lines 22-25; and page 147, lines 2-7 and lines 9-11.

Independent claim 5401 describes a combination of features including a mixture produced from a hydrocarbon containing formation. The mixture includes: ammonia and water, wherein greater than about 0.5 % by weight of the mixture comprises ammonia; and condensable

hydrocarbons, wherein less than about 0.3% of the condensable hydrocarbons comprise asphaltenes. Features of independent claim 5401 are described on page 141, lines 6-7 and lines 16-18; page 143, lines 22-25; and page 145, line 28 through page 146, line 2.

Claims 4430 and 5397 describe a combination of features including wherein the non-condensable hydrocarbons further comprise hydrocarbons having carbon numbers of less than 5, and wherein a weight ratio of the hydrocarbons having carbon numbers from 2 through 4 to methane in the mixture is greater than approximately 1. Features of claims 4430 and 5397 are described on page 141, line 16 through page 142, line 8.

Claims 4431 and 5398 describe a combination of features wherein greater than about 0.1 % by weight of the condensable hydrocarbons are olefins, and wherein less than about 15 % by weight of the condensable hydrocarbons are olefins. Features of claims 4431 and 5398 are described on page 144, line 20 through page 145, line 3.

Claims 4432 and 5400 describe a combination of features including wherein the non-condensable hydrocarbons further comprise ethene and ethane, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is greater than about 0.001, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15. Features of claims 4432 and 5400 are described on page 145, lines 11-14.

Claims 4433 and 5400 describe a combination of features, wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen Features of claims 4433 and 5402 are described on page 146, lines 9-13.

Claims 4434 and 5403 describe a combination of features wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen. Features of claims 4434 and 5403 are described on page 146, lines 15-20.

Claims 4435 and 5404 describe a combination of features wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur. Features of claims 4435 and 5404 are described on page 146, lines 27-31.

Claim 4436 describes a combination of features wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols. Features of claim 4436 are described on page 146, lines 20-25.

Claim 4437 describes a combination of features wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds. Features of claim 4437 are described on page 145, lines 16-20.

Claim 4438 describes a combination of features wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings. Features of claim 4438 are described on page 145, lines 21-26.

Claim 4439 describes a combination of features including wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes. Features of claim 4439 are described on page 145, line 28 through page 146, line 2.

Claim 4440 describes a combination of features including wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes. Features of claim 4440 are described on page 146, lines 4-7.

Claim 4441 describes a combination of features including wherein the H_2 is less than about 80 % by volume at 25 °C and one atmosphere absolute pressure of the non-condensable hydrocarbons and H_2. Features of claim 4441 are described on page 147, lines 9-11.

Claim 4442 describes a combination of features including wherein the condensable hydrocarbons further comprise sulfur containing compounds. Features of claim 4442 are described on page 146, lines 27-31.

Claims 4443, 5399, and 5405 describe a combination of features including wherein at least a portion of the ammonia is used to produce fertilizer. Features of claims 4443, 5399, and 5405 are described on page 42, lines 21-22 and page 143, line 25.

Claim 4444 describes a combination of features including wherein less than about 5% of the condensable hydrocarbons have carbon numbers greater than 25. Features of claim 4444 are described on page 143, line 30 through page 144, line 2.

Claim 4445 describes a combination of features including wherein the condensable hydrocarbons comprise olefins, wherein greater than about 0.001 % by weight of the condensable hydrocarbons comprise olefins, and wherein less than about 15% by weight of the condensable hydrocarbons comprise olefins. Features of claim 4445 are described on page 144, lines 20-23.

Claim 4446 describes a combination of features including wherein the condensable hydrocarbons comprise olefins, wherein greater than about 0.001 % by weight of the condensable hydrocarbons comprise olefins, and wherein less than about 10% by weight of the condensable hydrocarbons comprise olefins. Features of claim 4446 are described on page 144, lines 20-23.

Claim 4447 describes a combination of features including wherein the condensable hydrocarbons comprise oxygenated hydrocarbons, and wherein greater than about 1.5 % by weight of the condensable hydrocarbons comprises oxygenated hydrocarbons. Features of claim 4447 are described on page 144, lines 4-18.

Claim 4448 describes a combination of features including wherein the condensable hydrocarbons further comprise nitrogen containing compounds. Features of claim 4448 are described on page 146, lines 9-13.

VI. Grounds of Rejection

A. Claims 4429-4448 and 5396-5405 stand rejected under 35 U.S.C. §102(b) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 3,892,270 to Lindquist (hereinafter "Lindquist").

B. Claims 4429-4448 and 5396-5405 stand rejected under 35 U.S.C. §112, first paragraph as failing to comply with the enablement requirement.

C. Claims 4429-4448 and 5396-5405 stand provisionally rejected over claims of various copending applications.

VII. Argument

A. Claims 4429-4448 and 5396-5405 are patentable under 35 U.S.C. §102(b) and 35 U.S.C. §103(a) over Lindquist.

The Office Action states:

> Claims 4429-4448 and 5396-5405 are rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35.U.S.C. 103(a) as obvious over Lindquist.
>
> Lindquist, U.S. Patent No. 3,892,270 teaches recovering a gaseous product gas containing hydrocarbon values from a hydrocarbon-containing formation (column 3, lines 6-18). Hydrocarbons can be recovered from heavy-oil fields by partial oxidation and thermal cracking of the hydrocarbons in situ (column 3, lines 46-49). The product gas constituents may be optimized by controlling the ratio of oxidizing gas to steam (column 4, lines 3-4). The product reasonably appears to be either the same as or an obvious variation of the instantly claimed product because the product of Lindquist is also produced from a coal hydrocarbon formation and in a similar way as compared to the claimed product.

Appellant respectfully disagrees that the claims are anticipated and/or obvious in light of the cited prior art. Appellant submits that a *prima facie* case of anticipation or obviousness has not been established. As will be set forth in more detail below, the §102(b) and §103(a) rejections of claims 4429-4448 and 5396-5405 are respectfully traversed.

The Office Action states: "The product gas constituents may be optimized by controlling the ratio of oxidizing gas to steam." Appellant submits that the "optimization" for product gas constituents of the cited art being similar to components of the mixture claimed by the Appellant has not been established. For example, Appellant's independent claims 4429, 5936, and 5401 all describe features including: "wherein greater than about 0.5% by weight of the mixture comprises ammonia". Lindquist, however, does not appear to teach or suggest the presence of ammonia in product gas constituents.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d1226, 1236,9 USPQ2d 1913, 19200 (Fed. Cir. 1989). "To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991).

MPEP 2112 IV states: "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); *In re Oelrich*, 666 F.2d 578 581-82, 212 USPQ 323, 326

(CCPA 1981). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464, (Bd. Pat. App. & Inter. 1990) (emphasis in original).

The Office Action states: "In the event any difference can be shown for the product of claims 4429-4448 and 5396-5405, as opposed to the product taught by Lindquist, such differences would have been obvious to one of ordinary skill in the art as a routine modification of the product in the absence of a showing of unexpected results."

"To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Appellant submits that the cited art does not appear to teach or suggest production of a mixture with compositions similar to those claimed in the instant application.

Claims 4429, 5396, and 5401

Independent claims 4429, 5396, and 5401 describe a mixture produced from a hydrocarbon containing formation including, but not limited to: "ammonia and water, wherein greater than about 0.5 % by weight of the mixture comprises ammonia".

Regarding the demonstration described beginning in column 5, Lindquist states: "Periodic samples were taken of the gas and liquid products for later analysis.... A typical gas

composition consisted of 7 percent methane, 1.7 percent ethane, 12 percent carbon monoxide, 2 percent hydrogen, with the balance carbon dioxide." (Lindquist, col. 6, lines 48-60) Thus, Lindquist teaches a gas product that includes only methane, ethane, carbon monoxide, hydrogen, and carbon dioxide. Lindquist also states: "Condensate sample yield analysis is shown in Table II." (Lindquist, col. 6, lines 60-61) The "Detailed Composition Summary" in Table II indicates that 100 volume percent of the condensate sample is made up of various compounds with carbon numbers ranging from C_3 to C_{12}. Thus, Lindquist does not appear to teach or suggest that any portion of the gas or liquid product includes ammonia. Furthermore, the specification of Lindquist does not appear to mention nitrogen or any nitrogen-containing compounds in the gas or liquid product. Appellant respectfully requests removal of the rejections of claims 4429, 5396, and 5401.

Lindquist appears to suggest optimizing product gas constituents by controlling the ratio of oxidizing gas to steam (Lindquist, col. 4, lines 3-4). Appellant's Specification, however, describes heating a portion of the formation at a rate to selectively alter the content of produced fluids. Appellant submits that these methods are not the same, and Appellant's product is not necessarily the same as or an obvious variation of the product suggested by Lindquist.

Claim 4429 describes a combination of features including: "wherein greater than about 10% by volume at 25 °C and one atmosphere absolute pressure of the non-condensable hydrocarbons and H_2 comprises H_2".

Lindquist states: "The ratio of carbon monoxide to carbon dioxide and the volume percentage of C_1 and C_2 hydrocarbons to the total product gas are important." Lindquist (col. 4, lines 48-51) Thus, Lindquist appears to give gas composition in volume percent. The typical gas composition noted by Lindquist (col. 6, lines 57-60) appears to teach less than 10% H_2 by volume of the non-condensable hydrocarbons and H_2. Furthermore, Lindquist states: "It is desirable to maximize the Btu value of the product gas. This is done by optimizing production of methane relative to carbon monoxide and hydrogen. In maximizing production of methane, the reactions are favored by lower temperatures and higher space rates (short residence time of the

product gas in the high-temperature zone)." (Lindquist, col. 3, lines 52-58) Lindquist does not appear to teach or suggest increasing a relative amount of H_2 in the product gas.

Claims 4430 and 5397

Claims 4430 and 5397 describe a combination of features including: "wherein the non-condensable hydrocarbons further comprise hydrocarbons having carbon numbers of less than 5, and wherein a weight ratio of the hydrocarbons having carbon numbers from 2 through 4 to methane in the mixture is greater than approximately 1." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claims. Appellant respectfully requests removal of the rejection of claims 4430 and 5397.

Claims 4431 and 5398

Claims 4431 and 5398 describe a combination of features including: "wherein greater than about 0.1 % by weight and less than about 15 % by weight of the condensable hydrocarbons are olefins." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claims. Appellant respectfully requests removal of the rejection of claims 4431 and 5398.

Claims 4432 and 5399

Claims 4432 and 5400 describe a combination of features including: "wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is greater than about 0.001, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15." Lindquist states: "A typical gas composition consisted of 7 percent methane, 1.7 percent ethane, 12 percent carbon monoxide, 2 percent hydrogen, with the balance carbon dioxide." (Lindquist, col. 6, lines 57-60) Lindquist does not appear to teach or suggest the presence of ethene in the product gas. Appellant respectfully requests removal of the rejection of claims 4432 and 5400.

Claims 4433 and 5402

Claims 4433 and 5402 describe a combination of features including: "wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen." Lindquist does not appear to teach or suggest the presence of nitrogen. Appellant respectfully requests removal of the rejection of claims 4433 and 5402.

Claims 4434 and 5403

Claims 4434 and 5403 describe a combination of features including: "wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claims. Appellant respectfully requests removal of the rejection of claims 4434 and 5403.

Claims 4435 and 5404

Claims 4435 and 5404 describe a combination of features including: "wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur." Lindquist does not appear to teach or suggest the presence of sulfur. Appellant respectfully requests removal of the rejection of claims 4435 and 5404.

Claim 4436

Claim 4436 describes a combination of features including: "wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4436.

Claim 4437

Claim 4437 describes a combination of features including: "wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds." Table II of Lindquist indicates that aromatics account for 0.25 volume percent of the condensate sample. Lindquist does not appear to teach or suggest at least the above-quoted feature in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4437.

Claim 4438

Claim 4438 describes a combination of features including: "wherein less than about 5% by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings." Lindquist does not appear to teach or suggest at least the above-quoted feature in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4438.

Claim 4439

Claim 4439 describes a combination of features including: "wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes." Lindquist does not appear to teach or suggest at least the above-quoted feature in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4439.

Claim 4440

Claim 4440 describes a combination of features including: "wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes." Lindquist

does not appear to teach or suggest at least the above-quoted feature in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4440.

Claim 4441

Claim 4441 describes a combination of features including: "wherein the H_2 is less than about 80 % by volume at 25 °C and one atmosphere absolute pressure of the non-condensable hydrocarbons and H_2." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4441.

Claim 4442

Claim 4442 describes a combination of features including: "wherein the condensable hydrocarbons further comprise sulfur containing compounds." Lindquist does not appear to teach or suggest the presence of sulfur-containing compounds. Appellant respectfully requests removal of the rejection of claim 4442.

Claims 4443, 5399, and 5405

Claims 4443, 5399, and 5405 describe a combination of features including: "wherein at least a portion of the ammonia is used to produce fertilizer." Lindquist does not appear to teach or suggest producing ammonia or fertilizer. Appellant respectfully requests removal of the rejection of claims 4443, 5399, and 5405.

Claim 4444

Claim 4444 describes a combination of features including: "wherein less than about 5% of the condensable hydrocarbons have carbon numbers greater than 25." Lindquist does not

appear to teach or suggest at least the above-quoted feature in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4444.

Claim 4445

Claim 4445 describes a combination of features including: "wherein the condensable hydrocarbons comprise olefins, wherein greater than about 0.001 % by weight of the condensable hydrocarbons comprise olefins, and wherein less than about 15% by weight of the condensable hydrocarbons comprise olefins." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4445.

Claim 4446

Claim 4446 describes a combination of features including: "wherein the condensable hydrocarbons comprise olefins, wherein greater than about 0.001 % by weight of the condensable hydrocarbons comprise olefins, and wherein less than about 10% by weight of the condensable hydrocarbons comprise olefins." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4446.

Claim 4447

Claim 4447 describes a combination of features including: "wherein the condensable hydrocarbons comprise oxygenated hydrocarbons, and wherein greater than about 1.5 % by weight of the condensable hydrocarbons comprises oxygenated hydrocarbons." Lindquist does not appear to teach or suggest at least the above-quoted features in combination with other features of the claim. Appellant respectfully requests removal of the rejection of claim 4447.

Claim 4448

Claim 4448 describes a combination of features including: "wherein the condensable hydrocarbons further comprise nitrogen containing compounds." Lindquist does not appear to teach or suggest the presence of nitrogen containing compounds. Appellant respectfully requests removal of the rejection of claim 4448.

B. Claims 4429-4448 and 5396-5405 are patentable under 35 U.S.C. §112, first paragraph.

Claims 4429-4448 and 5396-5405 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. Appellant respectfully disagrees with these rejections.

The Office Action states:

> The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.
>
> To the extent it could be argued that the claimed composition is novel or unobvious, the claimed subject matter has not be[en] described in the specification in such a way as to enable one skilled in the art to make and/or use the invention, i.e., hydrocarbon formations differ in chemical composition and Appellants have not identified the chemical characteristics of the hydrocarbon formation from which the claimed product is derived.

MPEP 2164.01(b) states: "As long as the specification discloses at least one method for making and using the claimed invention that bears a reasonable correlation to the entire scope of the claim, then the enablement requirement of 35 U.S.C. 112 is satisfied. *In re Fischer*, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970).

MPEP 2164.03 states:

> The amount of guidance or direction needed to enable the invention is inversely related to the amount of knowledge in the state of the art as well as

> the predictability in the art. *In re Fisher*, 427 F.2d 833, 839, ,166 USPQ 18, 24 (CCPA 1970). The 'amount of guidance or direction' refers to that information in the application, as originally filed, that teaches exactly how to make or use the invention. The more that is known in the prior art about the nature of the invention, how to make, and how to use the invention, and the more predictable the art is, the less information needs to be explicitly stated in the specification.... See, e.g., *Chiron Corp. v. Genentech Inc.*, 363 F.3d 1247, 1254, 70 USPQ2d 1321, 1326 (Fed. Cir. 2004)....

MPEP 2164.05(a) states:

> The specification need not disclose what is well-known to those skilled in the art and preferably omits that which is well-known to those skilled and already available to the public. *In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987); and *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1463, 221 USPQ 481, 489 (Fed. Cir. 1984).

MPEP 2164.08 states:

> All that is necessary is that one skilled in the art be able to practice the claimed invention, given the level of knowledge and skill in the art. Further, the scope of enablement must only bear a 'reasonable correlation' to the scope of the claims. See, e.g., In re Fischer, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970).

Claims 4429-4448 and 5396-5405 were rejected as being anticipated by or, in the alternative, as obvious over Lindquist. Claims 4429-4448 and 5396-5405 were also rejected as failing to comply with the enablement requirement. Appellant submits that, in view of at least the above-quoted excerpts from the MPEP, rejection of claims 4429-4448 and 5396-5405 as obvious and, at the same time, as failing to comply with the enablement requirement is inconsistent.

Appellant maintains that suitable hydrocarbon formations are described at least from line 29 of page 51 through line 13 of page 56 of the Specification. The above-referenced section of the specification, and the figure referred to in the section, are included in the Appendix as pages 25-30. Moreover, the specification includes descriptions on how to make the compositions set forth in the relevant claims. Descriptions on how to make the compositions are described at least from line 25 of

page 45 through line 26 of page 46, and from line 15 of page 56 through line 6 of page 57. The above-referenced sections of the specification, and the figures referred to in the sections, are included in the Appendix as pages 31-35. Appellant respectfully requests removal of the rejection of claims 4429-4448 and 5396-5405.

C. Claims 4429-4448 and 5396-5405 are patentable over claims of various copending applications.

Claims 4429-4448 and 5396-5405 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 4184-4224 and 4242-4280 of copending Application No. 09/841,127. Claims 4429-4448 and 5396-5405 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 4369-4402 of copending Application No. 09/841,240. Claims 4429-4448 and 5396-5405 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 4188-4284 of copending Application No. 09/841,310. Appellant does not believe that a terminal disclaimer is needed for the present application and the above-noted applications. Appellant will provide an appropriate terminal disclaimer upon allowance of the claims (except for the double patenting rejections) if applications 09/841,127; 09/841,240; and 09/841,310 are pending or have matured into patents.

In sum, the claims on appeal are enabled, and are novel and non-obvious over the cited art. Appellant believes that the claims are in condition for allowance. Appellant has provided evidence that the invention defined in the appealed claims is not obvious to one skilled in the art. Appellant believes that the rejections of the claims are based on unsupported assumptions about the cited art. Such rejections do not meet the standard of legal anticipation and/or obviousness and should be overturned. Such favorable action by the Board is requested.

IX. Conclusion

For the above-noted reasons, it is submitted that the rejections of claims 4429-4448 and 5396-5405 were erroneous, and reversal of the rejections is respectfully requested.

A fee authorization is enclosed to cover the fee for filing a brief in support of an appeal. If any fees are omitted or if fees have been overpaid, please appropriately charge or credit those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5659-03700.

Respectfully submitted,

Eric B. Meyertons
Reg. No. 34,876

Attorney for Appellant

MEYERTONS, HOOD, KIVLIN, KOWERT & GOETZEL, P.C.
P.O. BOX 398
AUSTIN, TX 78767-0398
(512) 853-8800 (voice)
(512) 853-8801 (facsimile)

Date: DEC 13, 2005

X. Appendix

4429. (previously presented): A mixture produced from a hydrocarbon containing formation, comprising:

non-condensable hydrocarbons and H_2, wherein greater than about 10% by volume at 25 °C and one atmosphere absolute pressure of the non-condensable hydrocarbons and H_2 comprises H_2;

ammonia and water, wherein greater than about 0.5 % by weight of the mixture comprises ammonia; and

condensable hydrocarbons.

4430. (previously presented): The mixture of claim 4429, wherein the non-condensable hydrocarbons further comprise hydrocarbons having carbon numbers of less than 5, and wherein a weight ratio of the hydrocarbons having carbon numbers from 2 through 4 to methane in the mixture is greater than approximately 1.

4431. (original): The mixture of claim 4429, wherein greater than about 0.1 % by weight of the condensable hydrocarbons are olefins, and wherein less than about 15 % by weight of the condensable hydrocarbons are olefins.

4432. (original): The mixture of claim 4429, wherein the non-condensable hydrocarbons further comprise ethene and ethane, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is greater than about 0.001, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15.

4433. (original): The mixture of claim 4429, wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

4434. (original): The mixture of claim 4429, wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

4435. (original): The mixture of claim 4429, wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

4436. (original): The mixture of claim 4429, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

4437. (original): The mixture of claim 4429, wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

4438. (original): The mixture of claim 4429, wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

4439. (original): The mixture of claim 4429, wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

4440. (original): The mixture of claim 4429, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

4441. (previously presented): The mixture of claim 4429, wherein the H_2 is less than about 80 % by volume at 25 °C and one atmosphere absolute pressure of the non-condensable hydrocarbons and H_2.

4442. (original): The mixture of claim 4429, wherein the condensable hydrocarbons further comprise sulfur containing compounds.

4443. (previously presented): The mixture of claim 4429, wherein at least a portion of the ammonia is used to produce fertilizer.

4444. (original): The mixture of claim 4429, wherein less than about 5% of the condensable hydrocarbons have carbon numbers greater than 25.

4445. (previously presented): The mixture of claim 4429, wherein the condensable hydrocarbons comprise olefins, wherein greater than about 0.001 % by weight of the condensable hydrocarbons comprise olefins, and wherein less than about 15% by weight of the condensable hydrocarbons comprise olefins.

4446. (previously presented): The mixture of claim 4429, wherein the condensable hydrocarbons comprise olefins, wherein greater than about 0.001 % by weight of the condensable hydrocarbons comprise olefins, and wherein less than about 10% by weight of the condensable hydrocarbons comprise olefins.

4447. (original): The mixture of claim 4429, wherein the condensable hydrocarbons comprise oxygenated hydrocarbons, and wherein greater than about 1.5 % by weight of the condensable hydrocarbons comprises oxygenated hydrocarbons.

4448. (original): The mixture of claim 4429, wherein the condensable hydrocarbons further comprise nitrogen containing compounds.

5396. (previously presented): A mixture produced from a hydrocarbon containing formation, comprising:

a non-condensable component comprising hydrocarbons and H_2, wherein the H_2 is less than about 80 % by volume at 25 °C and one atmosphere absolute pressure of the non-condensable component;

ammonia and water, wherein greater than about 0.5 % by weight of the mixture comprises ammonia; and

condensable hydrocarbons.

5397. (previously presented): The mixture of claim 5396, wherein the non-condensable component comprises hydrocarbons having carbon numbers of less than 5, and wherein a weight ratio of the hydrocarbons having carbon numbers from 2 through 4 to methane in the mixture is greater than approximately 1.

5398. (previously presented): The mixture of claim 5396, wherein greater than about 0.1 % by weight and less than about 15 % by weight of the condensable hydrocarbons are olefins.

5399. (previously presented): The mixture of claim 5396, wherein at least a portion of the ammonia is used to produce fertilizer.

5400. (previously presented): The mixture of claim 5396, wherein the non-condensable component comprises ethene and ethane, wherein a molar ratio of ethene to ethane in the non-condensable component is greater than about 0.001, and wherein a molar ratio of ethene to ethane in the non-condensable component is less than about 0.15.

5401. (previously presented): A mixture produced from a hydrocarbon containing formation, comprising:

ammonia and water, wherein greater than about 0.5 % by weight of the mixture comprises ammonia; and

condensable hydrocarbons, wherein less than about 0.3% of the condensable hydrocarbons comprise asphaltenes.

5402. (previously presented): The mixture of claim 5401, wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

5403. (previously presented): The mixture of claim 5401, wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

5404. (previously presented): The mixture of claim 5401, wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

5405. (previously presented): The mixture of claim 5401, wherein at least a portion of the ammonia is used to produce fertilizer.

Specification page 51, line 29 through page 56, line 13:

Hydrocarbon containing formations may be selected for in situ treatment based on properties of at least a portion of the formation. For example, a formation may be selected based on richness, thickness, and depth (i.e., thickness of overburden) of the formation. In addition, a formation may be selected that will have relatively high quality fluids produced from the formation. In certain embodiments the quality of the fluids to be produced may be assessed in advance of treatment, thereby generating significant cost savings since only more optimal formations will be selected for treatment. Properties that may be used to assess hydrocarbons in a formation include, but are not limited to, an amount of hydrocarbon liquids that tend to be produced from the hydrocarbons, a likely API gravity of the produced hydrocarbon liquids, an amount of hydrocarbon gas that tends to be produced from the hydrocarbons, and/or an amount of carbon dioxide and water that tend to be produced from the hydrocarbons.

Another property that may be used to assess the quality of fluids produced from certain kerogen containing formations is vitrinite reflectance. Such formations include, but are not limited to, coal formations and oil shale formations. Hydrocarbon containing formations that include kerogen can typically be assessed/selected for treatment based on a vitrinite reflectance of the kerogen. Vitrinite reflectance is often related to a hydrogen to carbon atomic ratio of a kerogen and an oxygen to carbon atomic ratio of the kerogen, as shown by the dashed lines in Fig. 2. For example, a van Krevelen diagram may be useful in selecting a resource for an in situ conversion process.

Vitrinite reflectance of a kerogen in a hydrocarbon containing formation tends to indicate which fluids may be produced from a formation upon heating. For example, a vitrinite reflectance of approximately 0.5 % to approximately 1.5 % tends to indicate a kerogen that, upon heating, will produce fluids as described in region 7 above. Therefore, if a hydrocarbon containing formation having such kerogen is heated, a significant amount (e.g., majority) of the fluid produced by such heating will often include oil and other such hydrocarbon fluids. In addition, a vitrinite reflectance of approximately 1.5 % to 3.0 % may indicate a kerogen in region

9 as described above. If a hydrocarbon containing formation having such kerogen is heated, a significant amount (e.g., majority) of the fluid produced by such heating may include methane and hydrogen (and synthesis gas, if, for example, the temperature is sufficiently high and steam is injected). In an embodiment, at least a portion of a hydrocarbon containing formation selected for treatment in situ has a vitrinite reflectance in a range between about 0.2 % and about 3.0 %. Alternatively, at least a portion of a hydrocarbon containing formation selected for treatment has a vitrinite reflectance from about 0.5 % to about 2.0 %, and, in some circumstances, the vitrinite reflectance may range from about 0.5 % to 1.0 %. Such ranges of vitrinite reflectance tend to indicate that relatively higher quality formation fluids will be produced from the formation.

In an embodiment, a hydrocarbon containing formation may be selected for treatment based on a hydrogen content within the hydrocarbons in the formation. For example, a method of treating a hydrocarbon containing formation may include selecting a portion of the hydrocarbon containing formation for treatment having hydrocarbons with a hydrogen content greater than about 3 weight %, 3.5 weight %, or 4 weight % when measured on a dry, ash-free basis. In addition, a selected section of a hydrocarbon containing formation may include hydrocarbons with an atomic hydrogen to carbon ratio that falls within a range from about 0.5 to about 2, and in many instances from about 0.70 to about 1.65.

Hydrogen content of a hydrocarbon containing formation may significantly affect a composition of hydrocarbon fluids produced from a formation. For example, pyrolysis of at least some of the hydrocarbons within the heated portion may generate hydrocarbon fluids that may include a double bond or a radical. Hydrogen within the formation may reduce the double bond to a single bond. In this manner, reaction of generated hydrocarbon fluids with each other and/or with additional components in the formation may be substantially inhibited. For example, reduction of a double bond of the generated hydrocarbon fluids to a single bond may reduce polymerization of the generated hydrocarbons. Such polymerization tends to reduce the amount of fluids produced.

In addition, hydrogen within the formation may also neutralize radicals in the generated hydrocarbon fluids. In this manner, hydrogen present in the formation may substantially inhibit reaction of hydrocarbon fragments by transforming the hydrocarbon fragments into relatively short chain hydrocarbon fluids. The hydrocarbon fluids may enter a vapor phase and may be produced from the formation. The increase in the hydrocarbon fluids in the vapor phase may significantly reduce a potential for producing less desirable products within the selected section of the formation.

It is believed that if too little hydrogen is present in the formation, then the amount and quality of the produced fluids will be negatively affected. If too little hydrogen is naturally present, then in some embodiments hydrogen or other reducing fluids may be added to the formation.

When heating a portion of a hydrocarbon containing formation, oxygen within the portion may form carbon dioxide. It may be desirable to reduce the production of carbon dioxide and other oxides. In an embodiment, production of carbon dioxide may be reduced by selecting and treating a portion of a hydrocarbon containing formation having a vitrinite reflectance of greater than about 0.5 %. In addition, an amount of carbon dioxide produced from a formation may vary depending on, for example, an oxygen content of a treated portion of the hydrocarbon containing formation. Certain embodiments may thus include selecting and treating a portion of the formation having a kerogen with an atomic oxygen weight percentage of less than about 20 %, 15 %, and/or 10 %. In addition, certain embodiments may include selecting and processing a formation containing kerogen with an atomic oxygen to carbon ratio of less than about 0.15. Alternatively, at least some of the hydrocarbons in a portion of a formation selected for treatment may have an atomic oxygen to carbon ratio of about 0.03 to about 0.12. In this manner, production of carbon dioxide and other oxides from an in situ conversion process for hydrocarbons may be reduced.

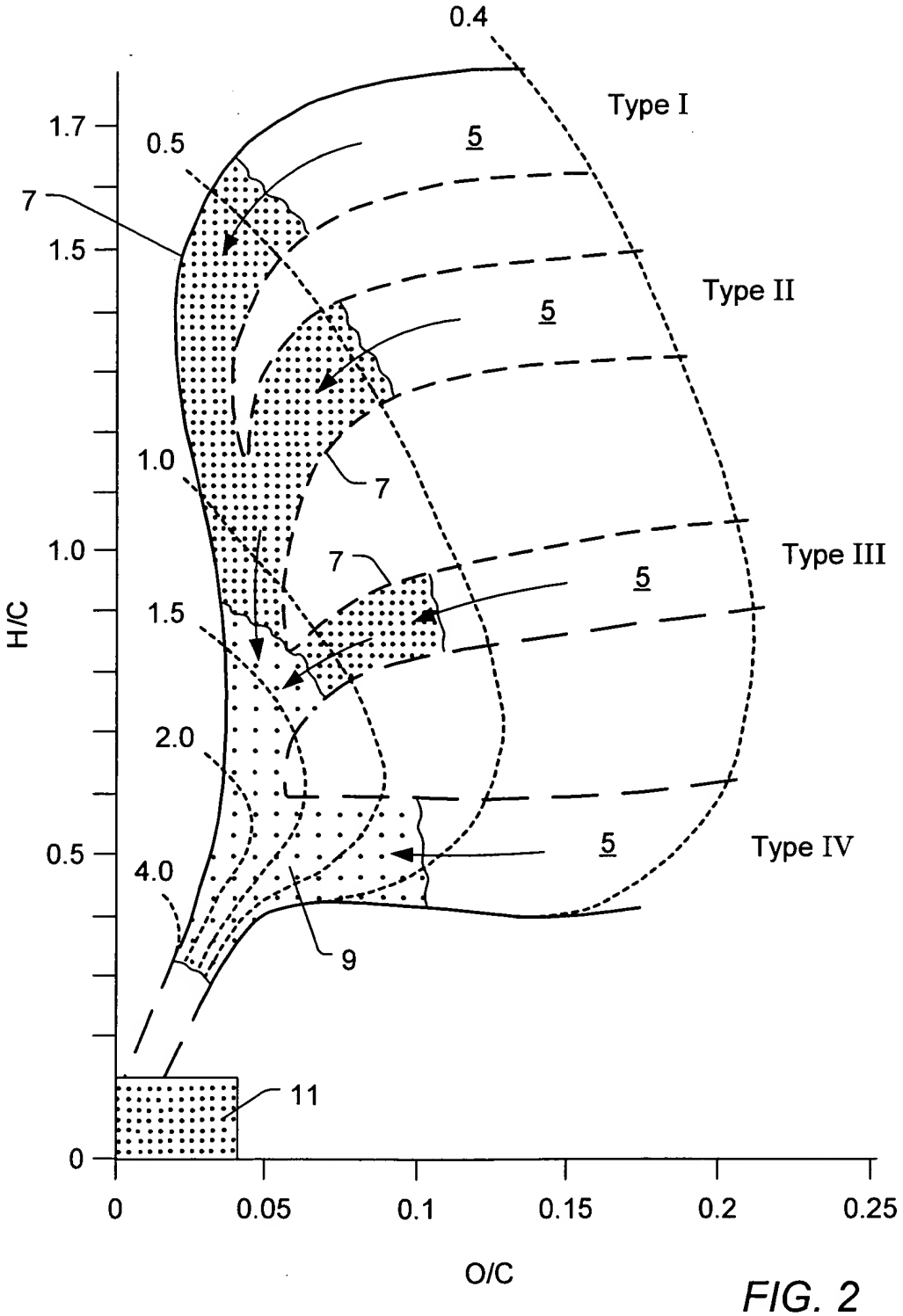
Heating a hydrocarbon containing formation may include providing a large amount of energy to heat sources located within the formation. Hydrocarbon containing formations may

contain water. Water present in the hydrocarbon containing formation will tend to further increase the amount of energy required to heat a hydrocarbon containing formation. In this manner, water tends to hinder efficient heating of the formation. For example, a large amount of energy may be required to evaporate water from a hydrocarbon containing formation. Thus, an initial rate of temperature increase may be reduced by the presence of water in the formation. Therefore, excessive amounts of heat and/or time may be required to heat a formation having a high moisture content to a temperature sufficient to allow pyrolysis of at least some of the hydrocarbons in the formation. In an embodiment, an in situ conversion process for hydrocarbons may include selecting a portion of the hydrocarbon containing formation for treatment having an initial moisture content of less than about 15 % by weight (in some embodiments dewatering wells may be used to reduce the water content of the formation). Alternatively, an in situ conversion process for hydrocarbons may include selecting a portion of the hydrocarbon containing formation for treatment having an initial moisture content of less than about 10 % by weight.

In an embodiment, a hydrocarbon containing formation may be selected for treatment based on additional factors such as a thickness of hydrocarbon containing layer within the formation and assessed liquid production content. For example, a hydrocarbon containing formation may include multiple layers. Such layers may include hydrocarbon containing layers, and also layers that may be hydrocarbon free or have substantially low amounts of hydrocarbons. Each of the hydrocarbon containing layers may have a thickness that may vary depending on, for example, conditions under which the hydrocarbon containing layer was formed. Therefore, a hydrocarbon containing formation will typically be selected for treatment if that formation includes at least one hydrocarbon containing layer having a thickness sufficient for economical production of formation fluids. A formation may also be chosen if the thickness of several layers that are closely spaced together is sufficient for economical production of formation fluids. Other formations may also be chosen based on a richness of the hydrocarbon resource within the soil, even if the thickness of the resource is relatively thin.

In addition, a layer of a hydrocarbon containing formation may be selected for treatment based on a thickness of the hydrocarbon containing layer, and/or a total thickness of hydrocarbon containing layers in a formation. For example, an in situ conversion process for hydrocarbons may include selecting and treating a layer of a hydrocarbon containing formation having a thickness of greater than about 2 m, 3 m, and/or 5 m. In this manner, heat losses (as a fraction of total injected heat) to layers formed above and below a layer of hydrocarbons may be less than such heat losses from a thin layer of hydrocarbons. A process as described herein, however, may also include selecting and treating layers that may include layers substantially free of hydrocarbons and thin layers of hydrocarbons.

Each of the hydrocarbon containing layers may also have a potential formation fluid yield that may vary depending on, for example, conditions under which the hydrocarbon containing layer was formed, an amount of hydrocarbons in the layer, and/or a composition of hydrocarbons in the layer. A potential formation fluid yield may be measured, for example, by the Fischer Assay. The Fischer Assay is a standard method which involves heating a sample of a hydrocarbon containing layer to approximately 500 °C in one hour, collecting products produced from the heated sample, and quantifying the amount of products produced. A sample of a hydrocarbon containing layer may be obtained from a hydrocarbon containing formation by a method such as coring or any other sample retrieval method.


0.4
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0.5
5
7
1.5
Type II
5
1.0
7
1.0
7
Type III
5
1.5
H/C
2.0
0.5
5
Type IV
4.0
9
11
0
0
0.05
0.1
0.15
0.2
0.25
O/C

FIG. 2

Specification page 45, line 26 through page 46, line 26:

Hydrocarbons in formations may be treated in various ways to produce many different products. In certain embodiments such formations may be treated in stages. FIG. 1 illustrates several stages of heating a hydrocarbon containing formation. FIG. 1 also depicts an example of yield (barrels of oil equivalent per ton) (y axis) of formation fluids from a hydrocarbon containing formation versus temperature (°C) (x axis) of the formation.

Desorption of methane and vaporization of water occurs during stage 1 heating in FIG. 1. For example, when a hydrocarbon containing formation is initially heated, hydrocarbons in the formation may desorb adsorbed methane. The desorbed methane may be produced from the formation. If the hydrocarbon containing formation is heated further, water within the hydrocarbon containing formation may be vaporized. In addition, the vaporized water may be produced from the formation. Heating of the formation through stage 1 is in many instances preferably performed as quickly as possible.

After stage 1 heating, the formation may be heated further such that a temperature within the formation reaches (at least) an initial pyrolyzation temperature (e.g., the temperature at the lower end of the temperature range shown as stage 2). A pyrolysis temperature range may vary depending on types of hydrocarbons within the formation. For example, a pyrolysis temperature range may include temperatures between about 250 °C and about 900 °C. In an alternative embodiment, a pyrolysis temperature range may include temperatures between about 270 °C to about 400 °C. Hydrocarbons within the formation may be pyrolyzed throughout stage 2.

Formation fluids including pyrolyzation fluids may be produced from the formation. The pyrolyzation fluids may include, but are not limited to, hydrocarbons, hydrogen, carbon dioxide, carbon monoxide, hydrogen sulfide, ammonia, nitrogen, water and mixtures thereof. As the temperature of the formation increases, the condensable hydrocarbons of produced formation fluid tends to decrease, and the formation will in many instances tend to produce mostly methane and hydrogen. If a hydrocarbon containing formation is heated throughout an entire pyrolysis

range, the formation may produce only small amounts of hydrogen towards an upper limit of the pyrolysis range. After all of the available hydrogen is depleted, a minimal amount of fluid production from the formation will typically occur.

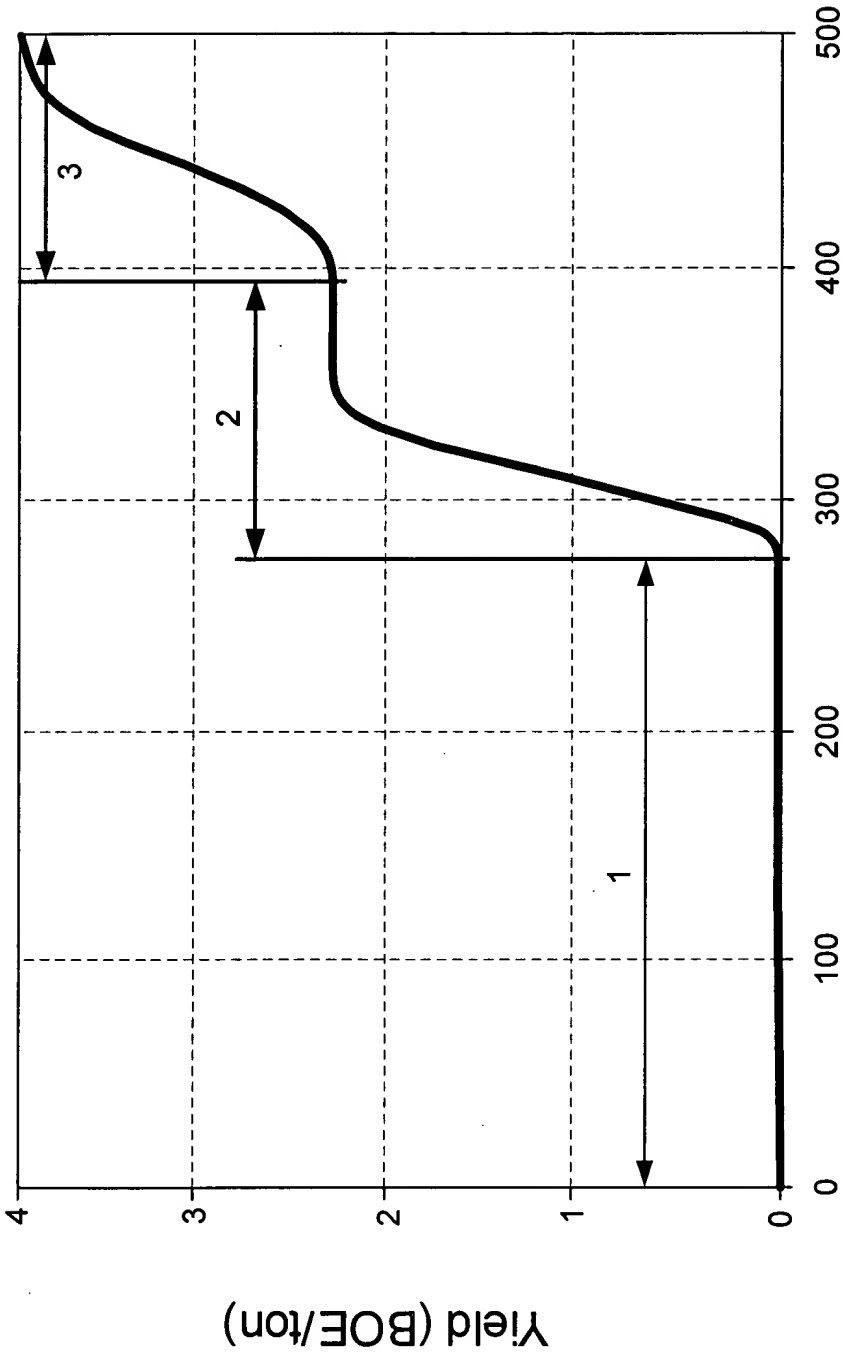

FIG. 1

Specification page 56, line 15 through page 57, line 6:

FIG. 3 shows a schematic view of an embodiment of a portion of an in situ conversion system for treating a hydrocarbon containing formation. Heat sources 100 may be placed within at least a portion of the hydrocarbon containing formation. Heat sources 100 may include, for example, electrical heaters such as insulated conductors, conductor-in-conduit heaters, surface burners, flameless distributed combustors, and/or natural distributed combustors. Heat sources 100 may also include other types of heaters. Heat sources 100 are configured to provide heat to at least a portion of a hydrocarbon containing formation. Energy may be supplied to the heat sources 100 through supply lines 102. The supply lines may be structurally different depending on the type of heat source or heat sources being used to heat the formation. Supply lines for heat sources may transmit electricity for electrical heaters, may transport fuel for combustors, or may transport heat exchange fluid that is circulated within the formation.

Production wells 104 may be used to remove formation fluid from the formation. Formation fluid produced from the production wells 104 may be transported through collection piping 106 to treatment facilities 108. Formation fluids may also be produced from heat sources 100. For example, fluid may be produced from heat sources 100 to control pressure within the formation adjacent to the heat sources. Fluid produced from heat sources 100 may be transported through tubing or piping to the collection piping 106 or the produced fluid may be transported through tubing or piping directly to the treatment facilities 108. The treatment facilities 108 may include separation units, reaction units, upgrading units, fuel cells, turbines, storage vessels, and other systems and units for processing produced formation fluids.

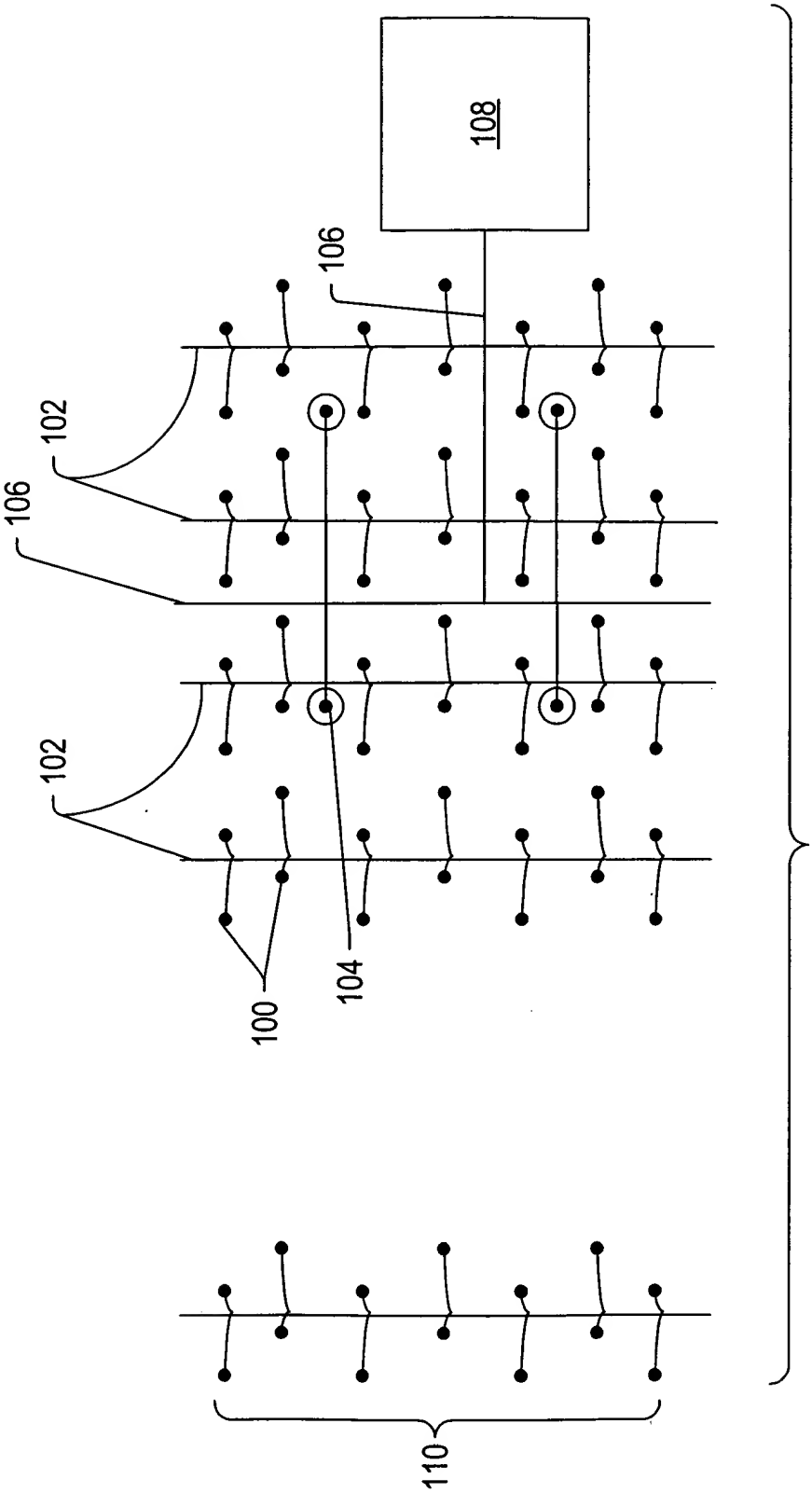

FIG. 3